WHAT IS CLAIMED:

1. A method of detecting one or more characteristics of cells comprising:
placing one or more cells of interest into an integrated microfluidic patch-clamp array chip providing easy cell trapping; easy optical characterizations; and simple cell loading for multiple single cell analysis.

2. A method of fabricating an integrated patch clamp device comprising:
preparing a mold by making height patterns defining narrow patch channels using deep etching;
adding patterns for wide connection regions;
introducing a settable material into the mold and curing;
detaching the set material from the mole;
placing holes for connection of tubes;
connecting tubes to reservoirs, via said holes, to load cells and/or electrolyte solutions and to apply suction to patch channel.

3. The method of claim 2 further wherein:
said mold is constructed from silicon.

4. The method of claim 2 further wherein:
said mold is constructed from a ceramic.

5. The method of claim 2 further wherein:
said mold is constructed from a metal or metal alloy.

6. The method of claim 2 further wherein:
said mold is formed using surface micromachining techniques.

7. The method of claim 2 further wherein:
said patterns defining the narrow patch channels are formed using deep reactive ion etching; and further patterns are added for wide connection regions using photoresist.

8. The method of claim 2 further wherein:
said moldable material comprises polydimethylsiloxane (PDMS) and a curing agent.

9. The method of claim 2 further comprising:

subsequently bonding a molded device to a thin PDMS layer which was spin cast and then cured onto a glass substrate.

10. The method of claim 2 further comprising:

subsequently bonding a molded device to a thin PDMS layer which was spin cast and then first partially cured before bonding onto a glass substrate.

11. A cell trapping device comprising:

a substrate;

a main reservoir able to hold cells in a fluidic medium;

at least one lateral opening in a side of said main reservoir;

at least one trapping channel operatively connected to said at least one lateral opening;

such that a cell in said main reservoir can be selectively immobilized at said lateral opening by negative pressure in said trapping channel.

12. The device according to claim 11 further wherein:

said substrate is a three dimensional structure comprising a length, a width and a thickness, said thickness being a smallest dimension; and

said side of said main reservoir is roughly parallel to said thickness.

13. The device according to claim 11 further wherein:

said substrate is a three dimensional structure comprising a length, a width and a thickness, said thickness being a smallest dimension; and

said side of said main reservoir is roughly parallel to said thickness.

14. The device according to claim 11 further comprising:

at least two electrical connections for measuring electrical characteristics between said main reservoir and said trapping channel.

15. The device according to claim 11 further wherein:

said lateral opening has effective dimensions of less than about 3 microns by 3 microns.

16. The device according to claim 11 further comprising:

at least three lateral openings in said main channel, said lateral openings spaced less than 40 microns apart.

17. The device according to claim 16 further wherein:
said lateral openings are electrically connected to operate as independent patch channels.

18. The device according to claim 16 further wherein:
said lateral openings are electrically connected to operate as independent patch channels and are arranged in a horizontal plane allowing multiplexed parallel patch sites that are less than 30 microns apart.

19. The device according to claim 17 further wherein:
patch channels are in a horizontal plane with multiplexed parallel patch sites having a distance between patch sites of between one hundred μm and one thousand μm.

20. The device according to claim 11 further comprising:
microfluidic features to move substances to appropriate positions of said device.

21. A multiple cell trapping device comprising:
a substrate;
a main reservoir able to hold cells in a fluidic medium running parallel to the largest dimensions of said substrate;
a plurality of lateral openings in sides of said main reservoir, at least some of said openings operatively connected to a plurality of trapping channels;
a microfluidic input for introducing cells in a fluid to said main reservoir;
one or more microfluidic trapping connections for applying negative pressure to said lateral openings;
such that cells in said main reservoir can be selectively immobilized at said lateral openings.

22. The device according to claim 21 further wherein:
said substrate is formed of an elastomer;
said lateral openings have a cross section less than about 3 microns by 3 microns; and
said lateral openings are operatively connected to trapping channels with cross sections less than about 3 microns by 3 microns.

23. A multiple cell trapping device comprising:
a substrate;

means for holding cells in fluid suspension in a main channel, said means running parallel to the largest dimensions of said substrate;

lateral cell trapping means formed in said substrate and operatively connected to said means for holding cells in fluid suspension;

means for applying negative pressure to said lateral cell trapping means in order to selectively immobilize cells at said lateral trapping means.

24. The device according to claim 23 further comprising:

means for measuring electrical properties between said means for holding cells and said lateral trapping means.

25. A device allowing fast application and removal of reagents from a sample area employing microfluidic delivery comprising:

a sample area;

a main channel; and

one or more an injection channels;

wherein in operation, a generally constant fluid flow is supplied to the main channel and said injection channel is being driven by a pressure as a function of time.

26. The device according to claim 23 further wherein said sample area may contain trapped cells, adherent cells on the device substrate, and/or other reaction loci such as microarray spots.

27. The device according to claim 23 further wherein said device can be constructed using very simple fabrication by elastomer micromolding.

28. The device according to claim 23 further wherein said main channel and said injection channels have a lateral configuration where all the channels are in roughly horizontal planes.

29. The device according to claim 23 further wherein:

said one or more injection channels comprise an array of a number of injection channels.

30. The device according to claim 23 further comprising upstream of the injection channel, a microfluidic mixer with an inlet connected a reagent reservoir and an inlet connected to a stock solution.

31. A device for connecting a microfluidic assay chip to external electrical and fluidic systems comprising:

an arrangement of hollow cylindrical electrical conductors connected to a plurality of electrical connectors.

32. The device according to claim 31 further wherein:
said conductors are arranged so as to operatively mate with fluidic connections on said assay chip.

33. The device according to claim 31 further wherein:
said conductors are arranged so as to operatively mate with fluidic couplings to an external fluidic system.

34. The device according to claim 31 further wherein:
said electrical connectors are arranged so as to operatively mate with an electrical socket of an electronic testing system.

35. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of Ag/AgCl.

36. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of a metal/metal-chloride alloy.

37. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of a metal/metal-chloride alloy.

38. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of a conducting polymer.

39. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of a metal.

40. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors are comprised of a conducting ceramic.

41. The device according to claim 31 further wherein:
said hollow cylindrical electrical conductors can be used with microfluidic systems to serve as both a fluidic interface and an electrical interface for microfluidic chips.

42. The device according to claim 31 further wherein as fluid flows through said hollow electrodes, electrical and fluidic connections are established.

43. The device according to claim 31 further wherein said hollow electrodes are reusable with multiple microfluidic chips.